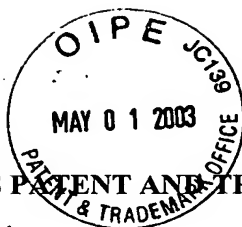


Docket No. 220049US0



1745
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05/08/03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Satoshi HIRAHARA, et al.

SERIAL NO: 10/083,385

GAU: 1745

FILED: February 27, 2002

EXAMINER:

FOR: CONDUCTIVE CARBONACEOUS-FIBER SHEET AND SOLID POLYMER ELECTROLYTE FUEL CELL

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Applicant(s) wish to disclose the following information.

REFERENCES

- ☐ The applicant(s) wish to make of record the references listed on the attached form PTO-1449. Copies of the listed references are attached, where required, as are either statements of relevancy or any readily available English translations of pertinent portions of any non-English language references.
- ☐ A check is attached in the amount required under 37 CFR §1.17(p).

RELATED CASES

- ☒ Attached is a list of applicant's pending application(s) or issued patent(s) which may be related to the present application. A copy of the patent(s), together with a copy of the claims and drawings of the pending application(s) is attached along with PTO 1449.
- ☐ A check is attached in the amount required under 37 CFR §1.17(p).

CERTIFICATION

- ☐ Each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.
- ☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to the knowledge of the undersigned, having made reasonable inquiry, was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this statement.

DEPOSIT ACCOUNT

- ☒ Please charge any additional fees for the papers being filed herewith and for which no check is enclosed herewith, or credit any overpayment to deposit account number 15-0030. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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LIST OF RELATED CASES

<u>Docket Number</u>	<u>Serial or Patent Number</u>	<u>Filing or Issue Date</u>	<u>Status or Patentee</u>
220049US0*	10/083,385	02/27/02	PENDING
234037US0	10/386,449	03/13/03	HIRAHARA, et al.

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TC 1700 MAIL ROOM

*Present Application; listed for information

CLAIMS

What we claim is:

1. A conductive carbonaceous fiber woven fabric comprising carbonaceous fiber
5 yarns having a metric count of 16 to 120, a carbonaceous fiber content of at least 60% by
weight, a weight per unit area of 50 to 150 g/m², a woven cloth thickness of 0.05 to 0.33 mm,
and an in-plane volume resistivity of no more than 0.1 Ωcm.

2. The conductive carbonaceous fiber woven fabric according to claim 1, wherein the
metric count is 16 to 60.

10 3. The conductive carbonaceous fiber woven fabric according to claim 1, wherein the
weight per unit area is 60 to 150 g/m².

4. The conductive carbonaceous fiber woven fabric according to claim 1, wherein
said conductive carbonaceous fiber woven fabric has a gas diffusivity of 50 to 130
cm³/cm²·sec as an air permeability determined in accordance with JIS-L-1096, method A.

15 5. The conductive carbonaceous fiber woven fabric according to claim 1, wherein
said conductive carbonaceous fiber woven fabric has a weave construction that is a plain
weave and has a yarn input for each of warps and wefts which is 30 to 70 per inch.

6. The conductive carbonaceous fiber woven fabric according to claim 1, wherein the
carbonaceous fibers are monofilaments having a diameter of 6 to 50 μm.

20 7. The conductive carbonaceous fiber woven fabric according to claim 1, wherein
said yarn is a spun yarn.

8. The conductive carbonaceous fiber woven fabric according to claim 7, wherein
said conductive carbonaceous fiber woven fabric comprises warps and wefts, wherein the
warps, the wefts, or the warps and the wefts are two-folded yarns.

25 9. The conductive carbonaceous fiber woven fabric according to claim 7, wherein
said yarn are selected from the group consisting of two-folded yarns having a metric count of
2/32 to 2/120 Nm and single yarns having a metric count of 1/16 to 1/60 Nm.

10. The conductive carbonaceous fiber woven fabric according to claim 1, wherein
the carbonaceous fiber yarns are carbonized products of acrylic fibers obtained by spinning a
30 polymer containing monomer units derived from acrylonitrile.

11. A solid polymer electrolyte fuel cell comprising a conductive carbonaceous fiber
woven fabric according to claim 1 as a gas diffusion layer material.

12. The solid polymer electrolyte fuel cell according to claim 11, further comprising
a solid polymer electrolyte membrane, a catalyst layer, and a current collector.

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13. A motor vehicle comprising the solid polymer electrolyte fuel cell according to claim 11 mounted therein.

14. A cogeneration power system comprising the solid polymer electrolyte fuel cell according to claim 11 installed therein.

5 15. The conductive carbonaceous fiber woven fabric according to claim 1, obtained by a process comprising: (a) weaving a precursor of carbonaceous fibers and (b) carbonizing the woven material.

16. A solid polymer electrolyte fuel cell comprising a conductive carbonaceous fiber woven fabric according to claim 15 as a gas diffusion layer material.

10 17. The solid polymer electrolyte fuel cell according to claim 16, further comprising a solid polymer electrolyte membrane, a catalyst layer, and a current collector.

18. A motor vehicle comprising the solid polymer electrolyte fuel cell according to claim 16 mounted therein.

15 19. A cogeneration power system comprising the solid polymer electrolyte fuel cell according to claim 16 installed therein.

20. A method of producing a conductive carbonaceous fiber woven fabric according to claim 1, comprising:

(a) producing oxidized spun yarns by:

- 20 (i) producing slivers by stretch-breaking a continuous filament tow;
(ii) drawing said slivers;
(iii) roving said slivers; and
(iv) fine spinning the slivers obtained after roving to obtain raw yarns wherein said raw yarns are selected from the group consisting of two-folded yarns having a metric count of 2/32 to 2/120 Nm and single
25 yarns having a metric count of 1/16 to 1/60 Nm; and

(b) weaving a conductive carbonaceous fiber woven fabric from said oxidized spun yarns.

21. A conductive carbonaceous fiber woven fabric consisting essentially of carbonaceous fiber yarns having a metric count of 16 to 120, a carbonaceous fiber content of at least 60% by weight, a weight per unit area of 50 to 150 g/m², a woven cloth thickness of
30 0.05 to 0.33 mm, and an in-plane volume resistivity of no more than 0.1 Ωcm.

ABSTRACT

The present invention provides a carbonaceous fiber woven fabric suitable for use as a gas diffusion layer material for solid polymer electrolyte fuel cells. Namely, the conductive carbonaceous fiber woven fabric of the present invention contains carbonaceous fiber yarns
5 having a metric count of 16 to 120, a carbonaceous fiber content of at least 60% by weight, a weight per unit area of 50 to 150 g/m², a woven cloth thickness of 0.05 to 0.33 mm, and an in-plane volume resistivity of no more than 0.1 Ωcm.